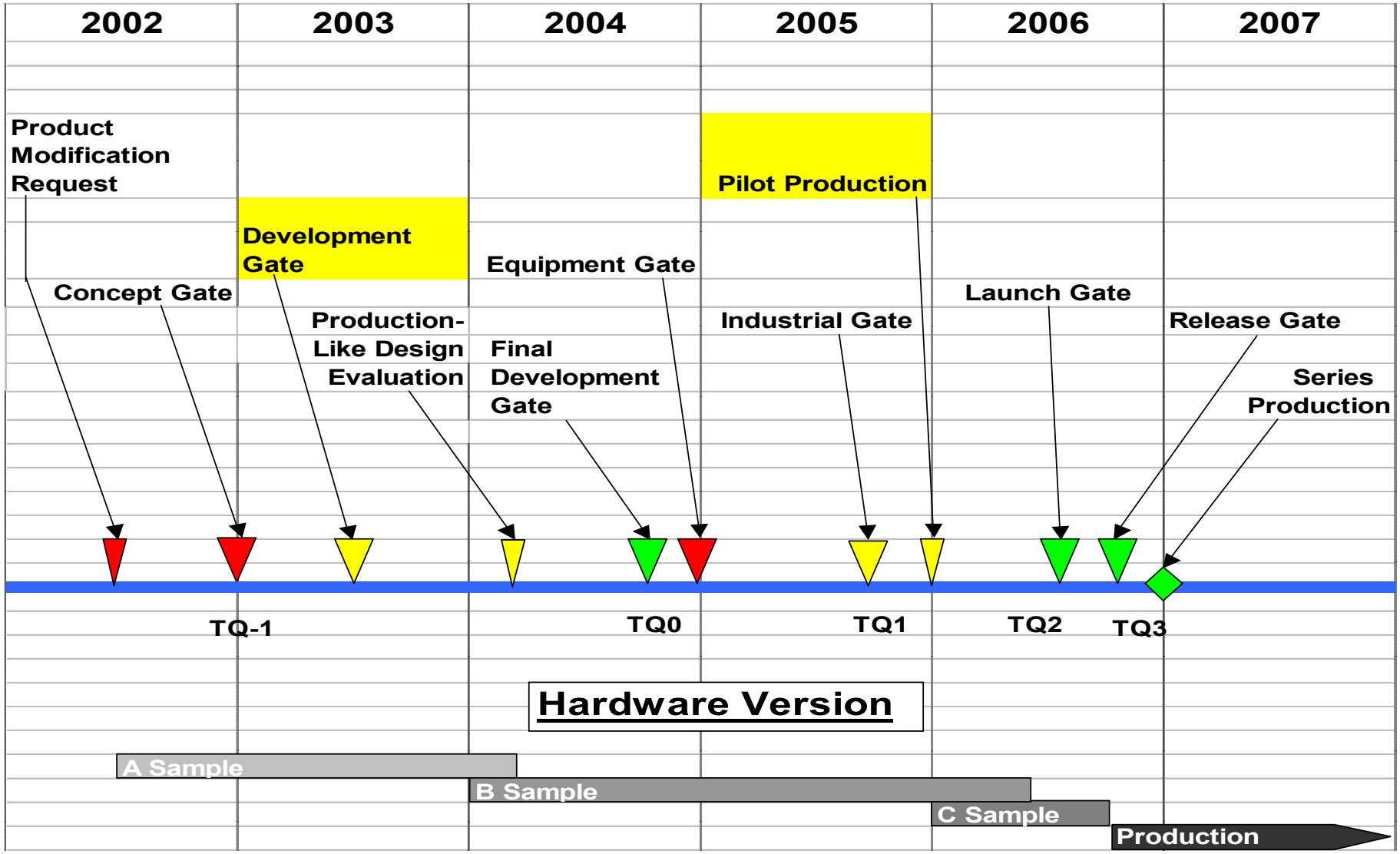
MACK POWERTRAIN'S COMMENTS ON 2007 FEASIBILITY

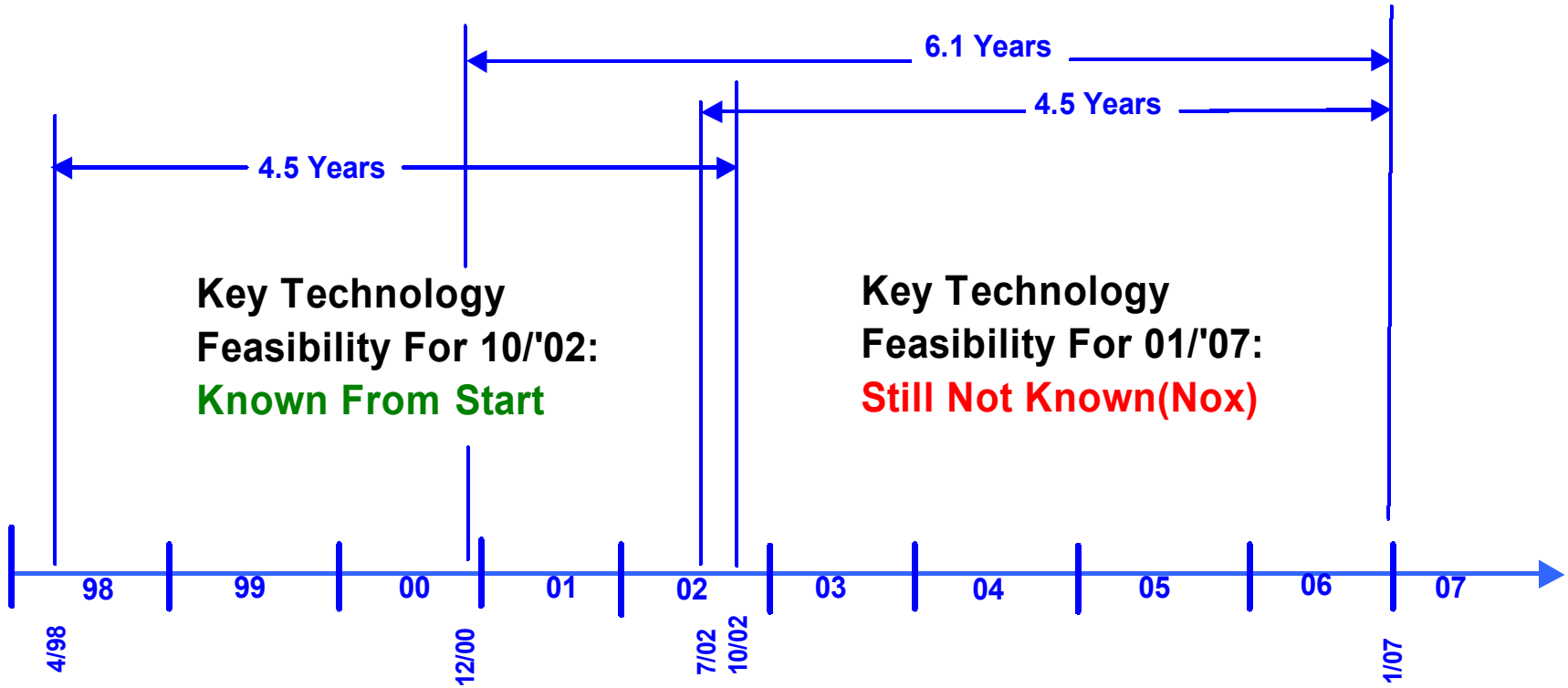
TOPICS

- SCHEDULE ISSUES
- DEVELOPMENT PROCESS/FEASIBILITY
- SYSTEM INTEGRATION
- NOx REDUCTION ALTERNATIVE

ENGINE PROGRAMS SCHEDULE



HEAVY DUTY DIESEL TRUCK EMISSIONS HISTORY AND FUTURE



Calendar Years

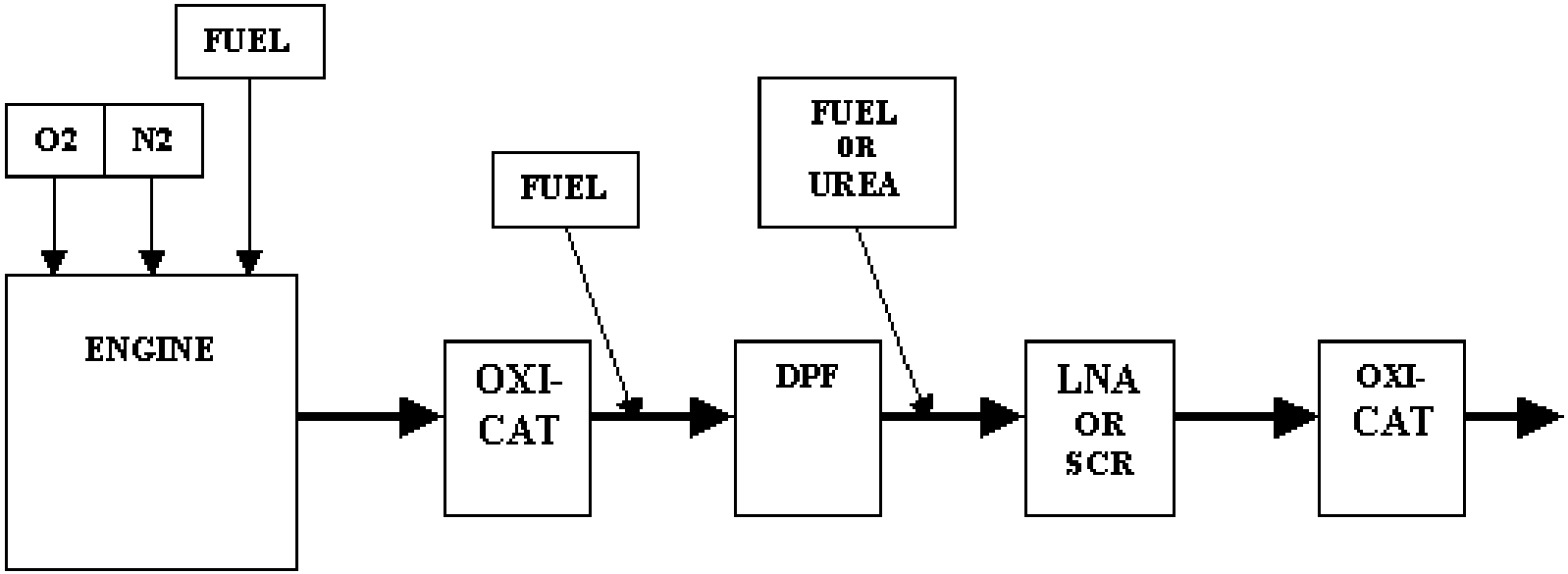
DEVELOPMENT PROCESS for 2007

- October 2002 Cooled EGR Base Engines with
  - Maximum Durability
  - Best Fuel Economy
- Technology Feasibility Proof
  - Aftertreatment for PM Oxidation
  - Aftertreatment for NOx Reduction
  - Control System for Engine/Aftertreatment Integration
- Ultra Low Sulfur Fuel Is Necessary In Every Scenario
- Production Engineering / Durability Development / Industrialization

Technology Feasibility Parameters

- Durability
  - Useful Life
- Functionality
  - Emissions
  - Performance
  - Reliability
  - System Integration
- Cost
  - First Cost
  - Fuel Economy
  - Maintenance
  - Installation Impact
  - Infrastructure

SYSTEM INTEGRATION FUNCTIONS



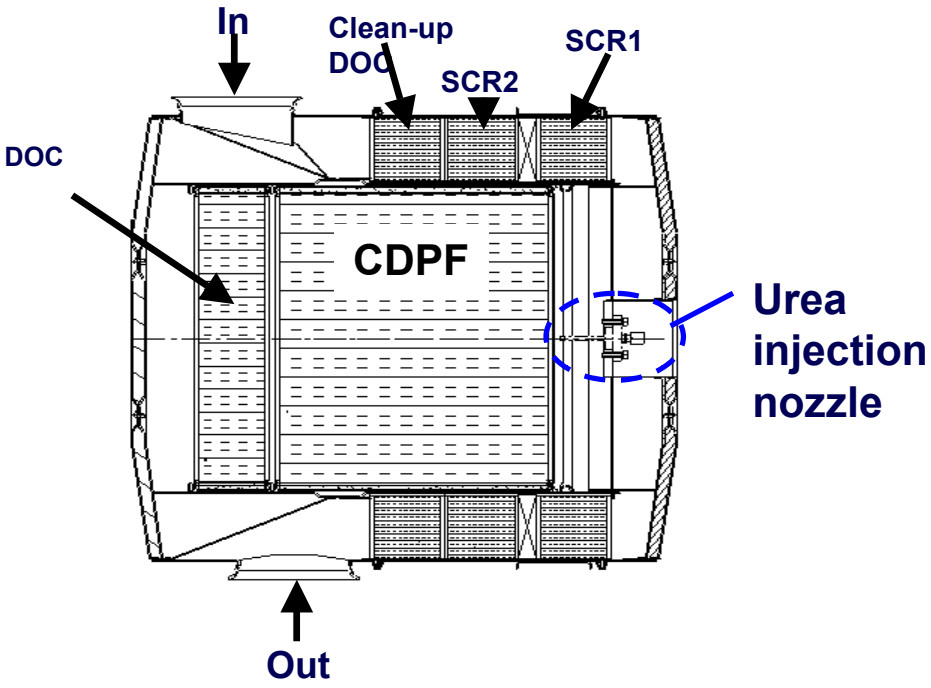
- Normal engine operation for vehicle mission objectives
- Modified engine operation to:
  - Regenerate CDPF when temperature is inadequate
  - Regenerate LNA when NOx adsorption rate decreases
  - Desulfate LNA when NOx adsorption period decreases
  - Above, without interrupting vehicle mission objectives

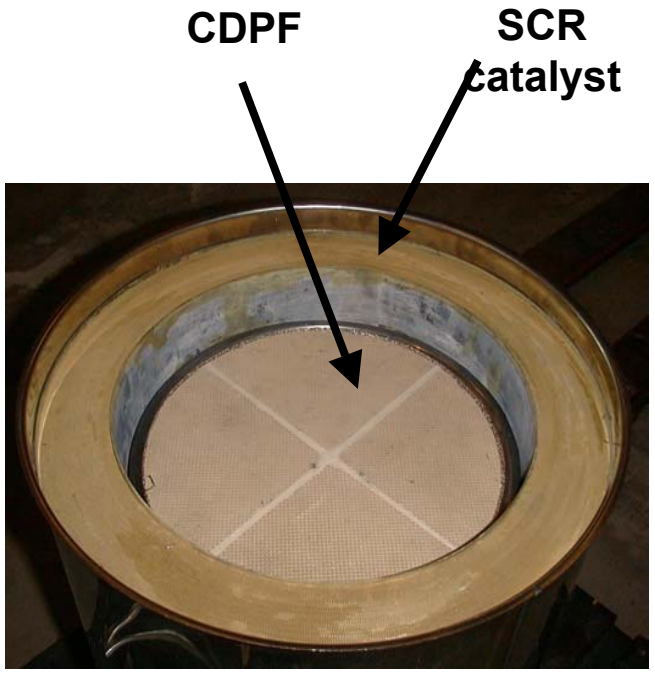
STATUS OF FEASIBILITY for CDPF/LNA

Definition of Feasibility	EMA CDPF Assessment	EMA NOx Adsorber Assessment
Functionality		
Emissions	GREEN	YELLOW
Performance	GREEN	YELLOW
Reliability	RED	RED
System Integration	YELLOW	RED
Durability		
Useful Life	YELLOW	RED
Cost		
First Cost	RED	RED
Fuel Economy	YELLOW	YELLOW
Maintenance	YELLOW	RED
Installation Impact	YELLOW	YELLOW
Infrastructure	YELLOW	RED

ALTERNATIVE NOx REDUCTION TECHNOLOGY

- EURO IV Technology Development Has Focused on Selective Catalytic Reduction(SCR) with Urea as Reductant
  - CDFP is integral to the System
  - ULSF(<10PPM) is necessary and in planning
- Urea-SCR Feasibility Is at a More Advanced State than LNA





STATUS OF SYSTEM FEASIBILITIES

Definition of Feasibility	EMA CDPF Assessment	EMA NOx Adsorber Assessment		Mack urea-SCR Assessment	EMA CDPF Assessment
Functionality					
Emissions	GREEN	YELLOW		GREEN	GREEN
Performance	GREEN	YELLOW		GREEN	GREEN
Reliability	RED	RED		YELLOW	RED
System Integration	YELLOW	RED		YELLOW	YELLOW
Durability					
Useful Life	YELLOW	RED		YELLOW	YELLOW
Cost					
First Cost	RED	RED		RED	RED
Fuel Economy	YELLOW	YELLOW		GREEN	YELLOW
Maintenance	YELLOW	RED		YELLOW	YELLOW
Installation Impact	YELLOW	YELLOW		YELLOW	YELLOW
Infrastructure	YELLOW	RED		RED	YELLOW

Summary(of Urea Infrastructure Feasibility)

- The contaminant thresholds of the SCR and complement emission control systems will dictate quality of urea needed. Urea of various quality grades is readily available.
- Existing pathways could be used to perform SCR UREA distribution.
- Sufficient urea production capacity exists worldwide to meet on-road SCR urea demand.
- Urea production and import levels are heavily influenced by natural gas prices
- Total mark-up for on-road SCR urea is estimated at $0.50 to $0.81 per gallon of SCR urea (32.5% by weight)
- Retail price for SCR-grade urea solution estimated to be $0.73-$1.00 per gallon when using domestically produced urea, and $0.70-$0.80/ gallon when using imported urea.

(Summary from NREL Sponsored A.D.Little (Urea) Study, 10/1/2001)